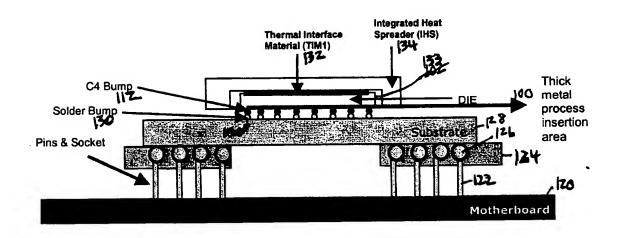
Page 1 of 14 Matter No.: 10559-857001 Applicants: Sarah E. Kim et al.

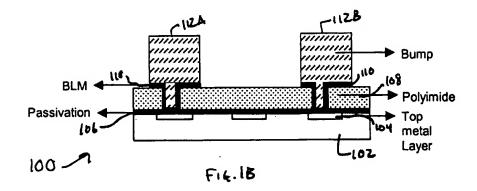
THICK METAL LAYER INTEGRATED PROCESS FLOW TO IMPROVE POWER DELIVERY AND MECHANICAL



F14.1A 7 150

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THICK METAL LAYER INTEGRATED PROCESS FLOW TO IMPROVE POWER DELIVERY AND MECHANICAL



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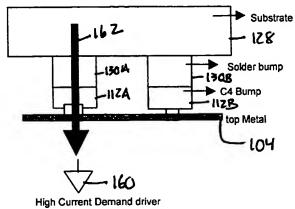
Matter No.: 10559-857001 Applicants: Sarah E. Kim et al.

THICK METAL LAYER INTEGRATED PROCESS FLOW TO

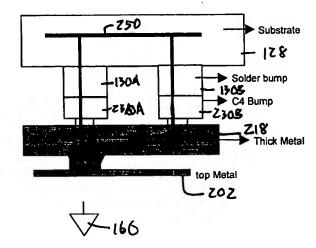
IMPROVE POWER DELIVERY AND MECHANICAL

**BUFFERING** 

## FIG. 1C



## FIG. 1D

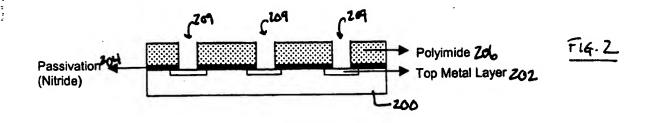


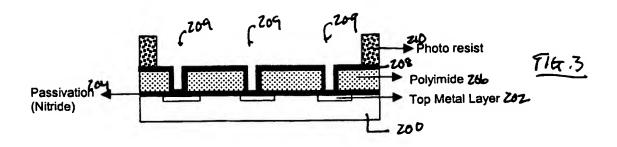
High Current Demand Driver

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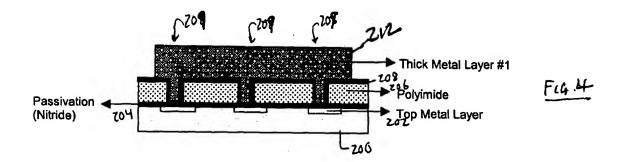
IMPROVE POWER DELIVERY AND MECHANICAL

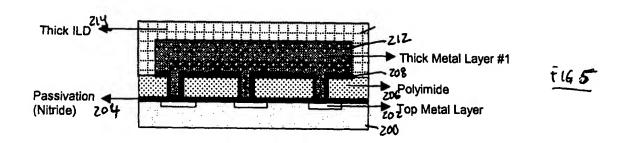


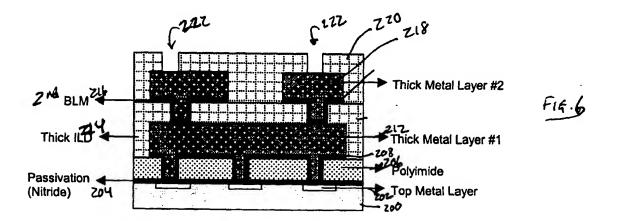


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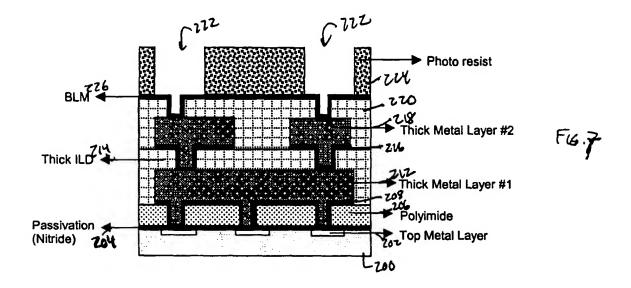
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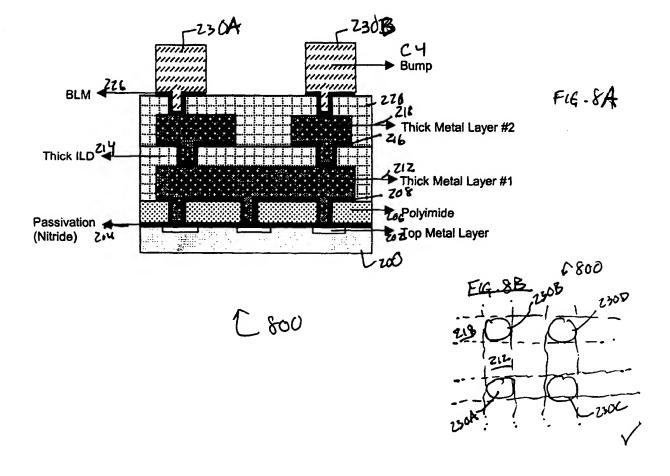
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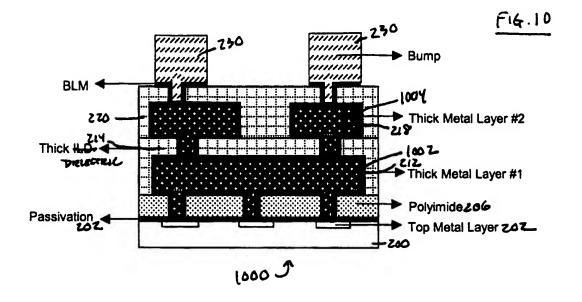
F14. 7A	F14.9B	F16. 11A	F4.19B	
Flow 1	Flow 2	Flow 3	Flow 4	
No Cu diffusion Barrier	No Cu diffusion Barrier	Need Cu diffusion	1. Need Cu diffusion	
Needed  2. Use photo-definable ILD	Needed  2. Use self-planarizing ILD	Barrier	Barrier	
Passivation Dep (Nitride)	Passivation Dep (Nitride)		2. Use self-planarizing ILD Passivation Dep (Nitride)	
	Polyimide Pattern (42			
Polyimide Pattern 46 Z		Polyimide Pattern 962	Polyimide Pattern 9 62	
Develop Polyimide 904	Develop Polyimide 964	Develop Polyimide 904	Develop Polyimide 984	
BLM Dep 906	BLM Dep 906	BLM Dep 906	BLM Dep 966	
PR Coating 908	PR Coating 908	PR Coating 968	PR Coating 965	
PR (Thick Metal Layer #1)	PR (Thick Metal Layer #1)	PR (Thick Metal Layer #1)	PR (Thick Metal Layer #1)	
Pattern 910 Cu Plating 9.7	Pattern 110 Cu Plating 91Z	Pattern 916 Cu Plating 912	Pattern 916	
			Cu Plating 412	
Resist Strip 414	Resist Strip 914	Resist Strip q14	Resist Strip 414	
BLM Etch/Ash Qu	BLM Etch/Ash 91	BLM Etch/Ash 916	BLM Etch/Ash 911	
Deposit dielectric 91% (photo-definable polymer)	Deposit dielectric 1/88	EL diffusion barrier plating	EL diffusion barrier plating	
Photo-pattern vias q Z6	(self-planarizing polymer) PR Coating 654	Deposit dielectric 918A	Deposit dielectric 4/88	
note patient via 4 26	11 County 454	(photo-definable polymer)	(self-planarizing polymer)	
Develop dielectric 922	Pattern vias 154	Photo-pattern vias 926	PR Coating 657	
BLM Dep 924	Etch dielectric (Dry) 958	Develop dielectric 972	Pattern vias 95%	
PR Coating 926	PR Strip 966	BLM Dep 9 14	Etch dielectric (Dry)	
PR (Thick Metal Layer #2)	BLM Dep 924	DD 0	PR Strip	
Pattern 978	424	PR Coating 926	966	
Cu Plating 930	PR Coating 124	PR (Thick Metal Layer #2) Pattern 9 25	BLM Dep \ZY	
Resist Strip 932	PR (Thick Metal Layer #2) Pattern 928	Cu Plating	PR Coating 9 26	
BLM Etch/Ash 934	Cu Plating 930	Resist Strip 932	PR (Thick Metal Layer #2) Pattern <b>97</b>	
Deposit dielectric 934 (photo-definable polymer)	Resist Strip 972	BLM Etch/Ash 134	Cu Plating 976	
Photo-pattern vias \$5\$	BLM Etch/Ash Q34	EL diffusion barrier plating	Resist Strip	
Develop dielectric 940	Deposit dielectric 462 (self-planarizing polymer)	Deposit dielectric (26 (photo-definable polymer)	BLM Etch/Ash 954	
BLM Dep 942	PR Coating 164	Photo-pattern vias 38	EL diffusion barrier plating	
PR Coating 944	Pattern vias 966	Develop dielectric 940	Deposit dielectric 962 (setf-planarizing polymer)	
Bump Pattern 946	Etch dielectric (Dry) 143	BLM Dep 942	PR Coating 96 Y	
Bump Plating 948	PR Strip 9+6	PR Coating 944	Pattern vias 944	
Resist Strip 150	BLM Dep 942	Bump Pattern 446	Etch dielectric (Dry) % 8	
BLM Etch/Ash 152	PR Coating 144	Bump Plating 948	PR Strip 976	
	Bump Pattern 946	Resist Strip	BLM Dep 942	
	Bump Plating 948	BLM Etch/Ash 952	PR Coating 644	
	Resist Strip 950	776	Bump Pattern Cub	
	BLM Etch/Ash 952		Bump Plating 948	
<del></del>			Resist Strip 950	
		L	4.10	

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	17						
	- 16						
	Fig.						
	Flow 5						
	Use Cu CMP process						
$\Gamma$	Passivation Dep (Nitride) 160						
- 1	Deposit dielectric (200						
ļ	PR Coating 1202						
1	Pattern vias 1704						
1	PR Coating 1206						
- 1	PR (Thick Metal Layer #1)						
	Pattern 1708						
151	BLM Dep 17.10						
1	Cu plating 1212						
1	Cu CMP 1214 -						
	Passivation Dep (Nitride)						
1	Deposit dielectric 1218						
- 1	PR Coating 12 ZO						
1	Pattern vias 12-1.2						
1	PR Coating 12-24						
1	PR (Thick Metal Layer #2)						
1.	Pattern (226						
224	BLM Dep 1228						
	Cu plating 1230						
L	Cu CMP 1232						
	Passivation Dep (Nitride)						
1.	Polyimide Pattern   7						
3.1	Covered borymines						
319	BLM Dep 1258						
	PR Coating 1240						
- 1	Bump Pattern 1242						
	Bump Plating 1244						
	Resist Strip						
し	BLM Etch/Ash 1248						
	•						

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Top Metal Layer

·200

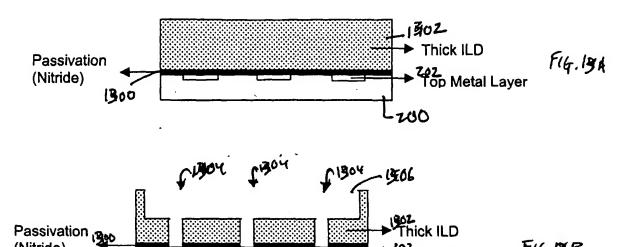
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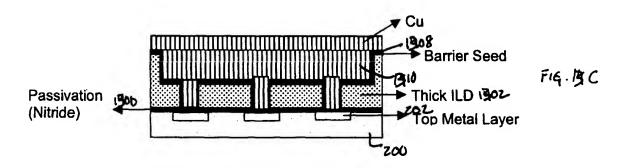
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THICK METAL LAYER INTEGRATED PROCESS FLOW TO

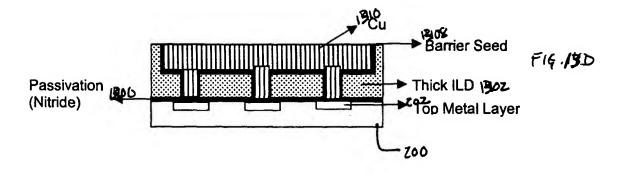
IMPROVE POWER DELIVERY AND MECHANICAL

**BUFFERING** 

(Nitride)



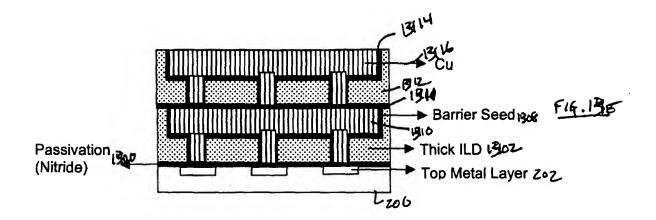


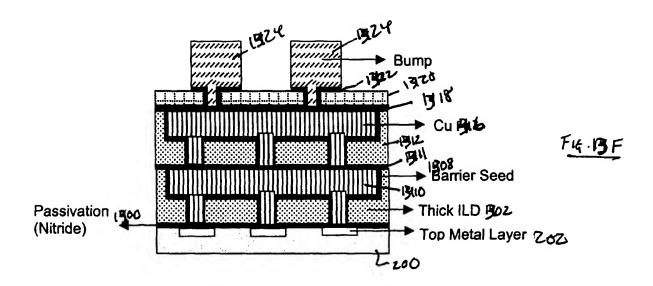


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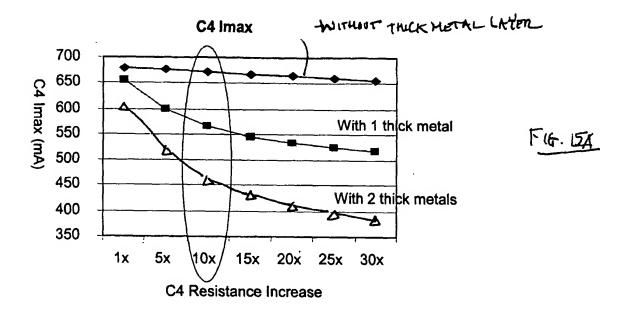
Γ	Simulation Parameters			Results	
	Additional Thick Metal Layers	Metal Width	Via Resistance (mΩ)	lmax (mA)	IR Drop (mV)
410-	Default (present sta	680	29		
•	Two 45 µm thick metal layers	70 μm for Metal layer #2 100 μm for Metal layer #1	0.7	430 (36% Imax improvement)	30
40Z-	Two 15 µm thick metal layers	70 μm for Metal layer #2 100 μm for Metal layer #1	0.7	530 (22% Imax improvement)	30
1404-	Two 45 µm thick metal layers	70 μm for Metal layer #2 100 μm for Metal layer #1	70	370 (46% Imax improvement)	49
i406 -	Two 15 μm thick metal layers	70 μm for Metal layer #2 100 μm for Metal layer #1	70	380 (44% Imax improvement)	51

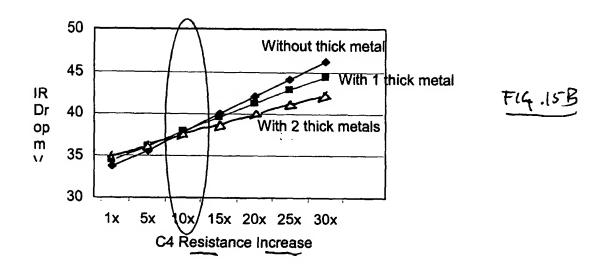
F16.14

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